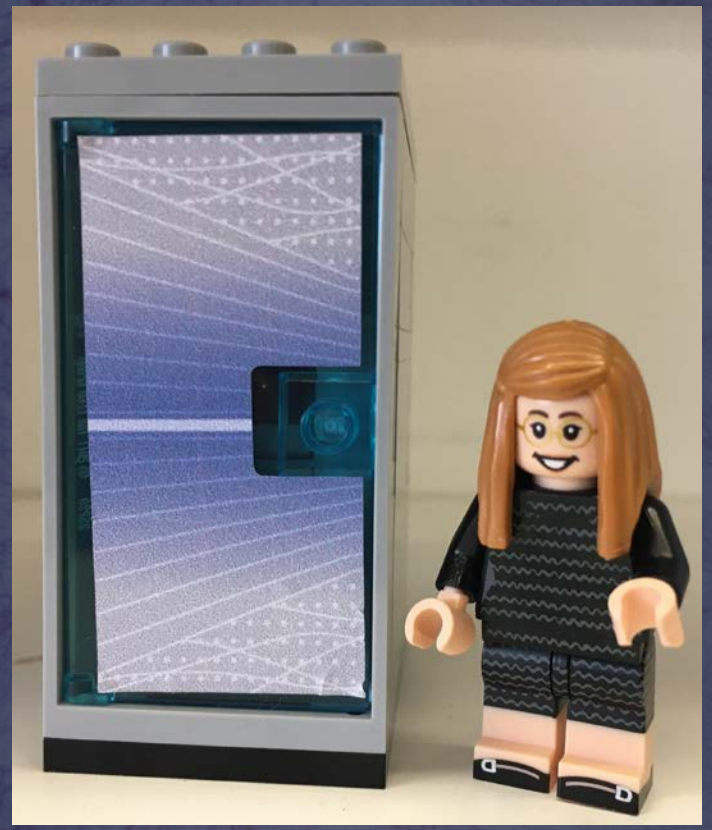
STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

The Archived Synthetic Data Initiative

Molly S. Peeples
with
Gregory F. Snyder, Theresa Dower, and the rest of the ASDI team

How many times have you found yourself in one of these positions?



I have a simulation I want people to compare data to, but it's difficult to keep track of which instrument configurations people may be interested in, and I'm not sure how to best model relevant noise properties!

I have some observations I would like to compare to models, but it's difficult to find ones that treat the measurements the same way I do!, so I don't know if we're talking about the same thing or not.

Imagine...

sims.MAST

Take advantage of accelerating computing to connect theoretical models to astronomical observations with synthetic data. Access simulated observations of astronomical objects for the Hubble Space Telescope and other MAST missions. Discover synthetic datasets and use them to create mock observations.

Select a topic.

Science= CGM spectra | exo-atmosphere

Select a data format.

Data Type= 1D spectra | 2D spectra | 3D Spectra | Images | Catalogs

+ ADD CONDITION

Add a parameter to filter by. See descriptions.
*Different catalogs have different parameters.

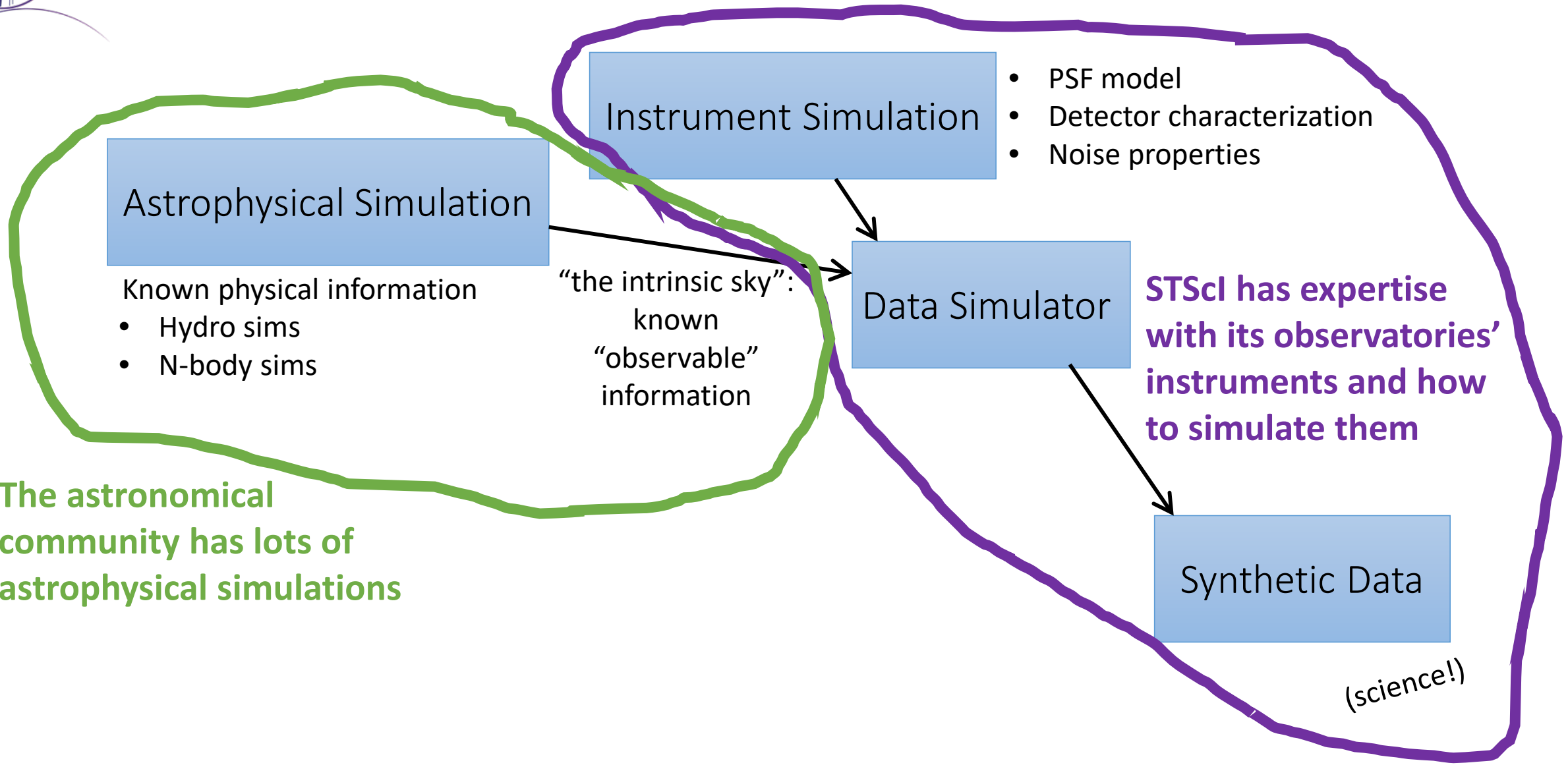
redshift ▼ | between ▼ | 2.0 | 3.0 | ✕

SEARCH

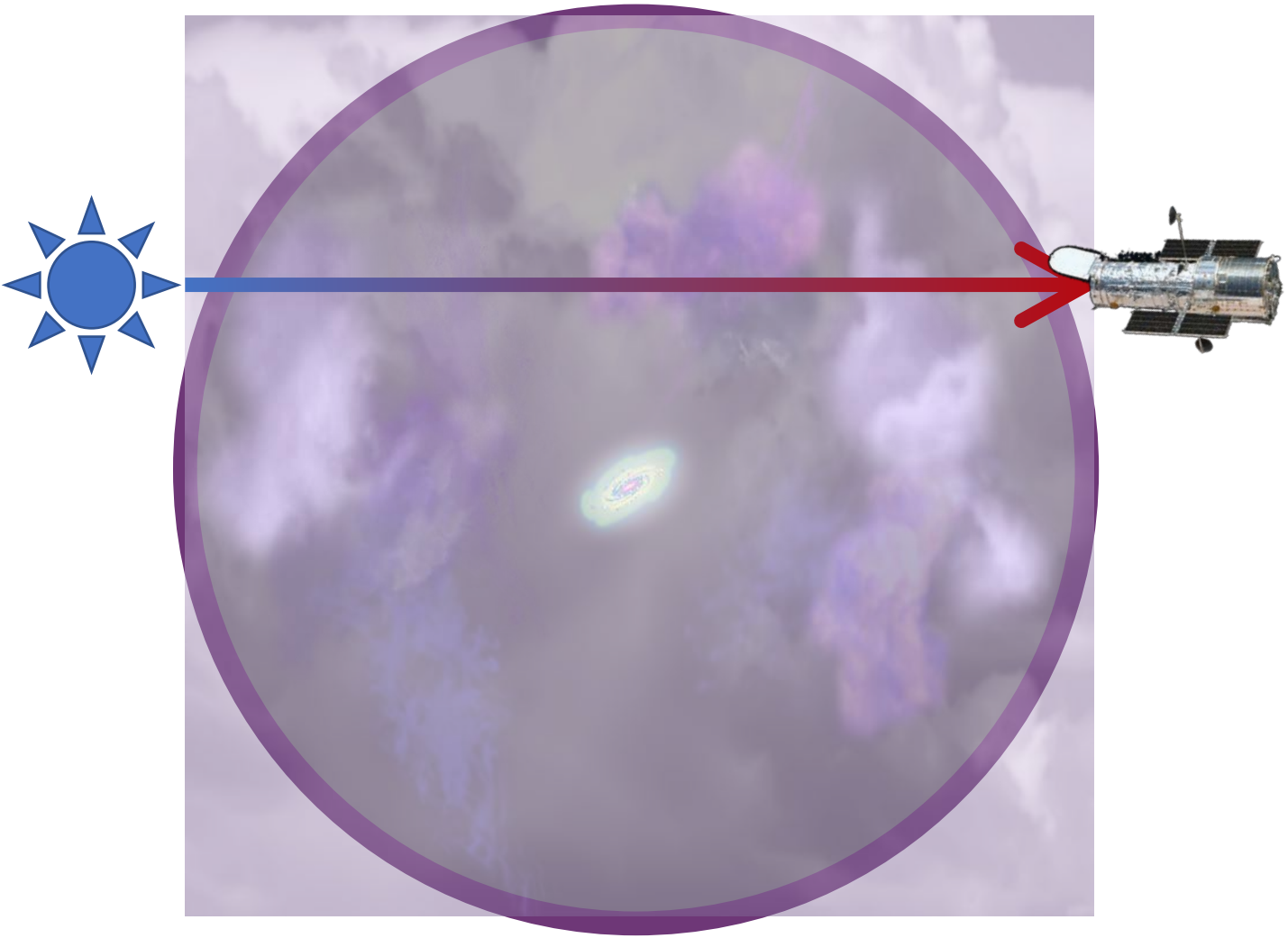
Contribute Synthetic Data

Want to contribute synthetic data to MAST?
Get in touch! We are happy to help.

What is a “simulation” anyhow?



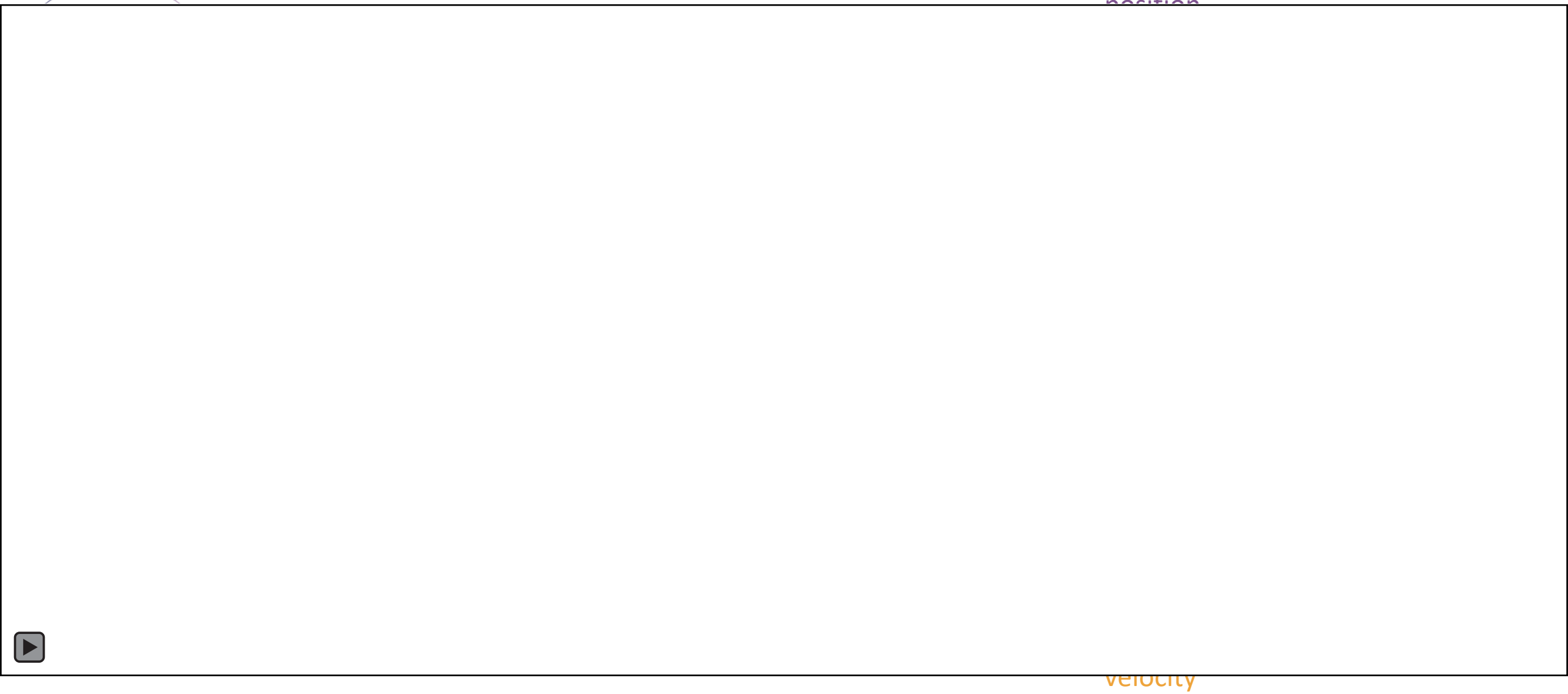
An example: absorption in the circumgalactic medium



The circumgalactic medium is the diffuse gas surrounding galaxies. Because it is so diffuse, it is generally observed in absorption against a bright background source (usually a quasar).

Thus, observationally, one must combine spectral profiles of different ionic transitions to back out the underlying gas density, metallicity, temperature, ionization state, kinematics, etc. In simulations, these gas properties are *known* and the "observed" spectra can be predicted.

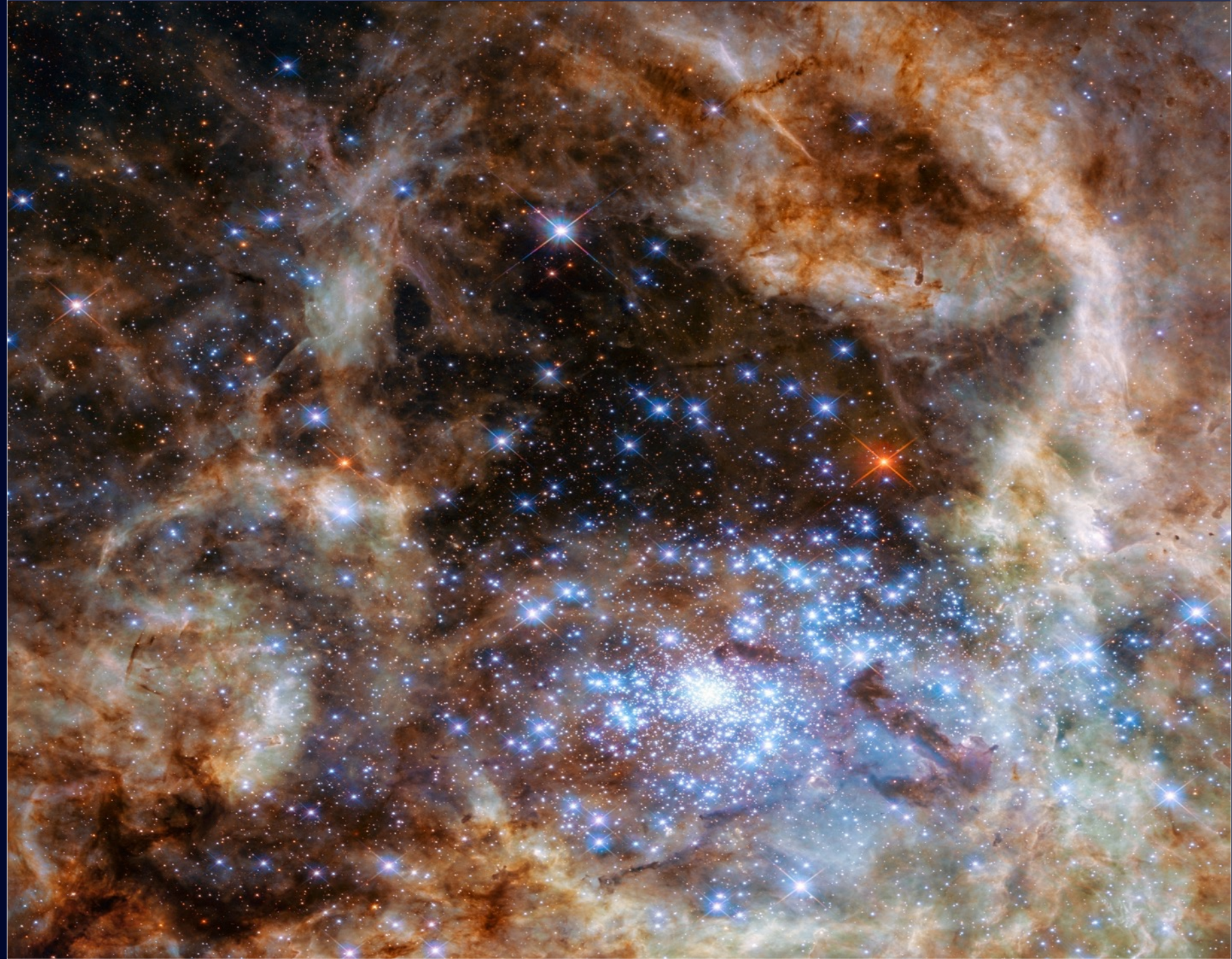
An example: absorption in the circumgalactic medium



The Archived Synthetic Data Initiative (ASDI) is more than a single science goal or observatory

The Hubble Space Telescope Senior Review, Summer 2019:

"The Hubble Project should consider the creation of a special archive for delivering theoretical results based on HST observations and archival studies (e.g., simulations and models."



More broadly: the Archived Synthetic Data Working Group, 2018

Working group explored different science cases that lend themselves from catalogs to large continuous datasets, from 1d aperture spectroscopy to 2d images to 3d integral field spectroscopy: what tools/ideas can be in common versus bespoke for each case? **Long term goal is to have ASDI expand to many more science areas!** A tricky part here will be connecting the "observable" information back to the underlying "physical" information for each science case.

Molly Peeples (chair, STScI) – CGM/IGM, galaxies

Natasha Batalha (STScI → UCSC) – exoplanets

Jonathan Hargis (STScI, Archives)

Josh Peek (STScI, Data Science Mission Office, MAST PI)

Robyn Sanderson (Caltech → UPenn) – resolved stellar populations

Arfon Smith (STScI, Data Science Mission Office)

Greg Snyder (STScI, Archives) – galaxies

Rachel Somerville (Rutgers, CCA) – galaxies

What might synthetic data in MAST look like in practice?

sims.MAST

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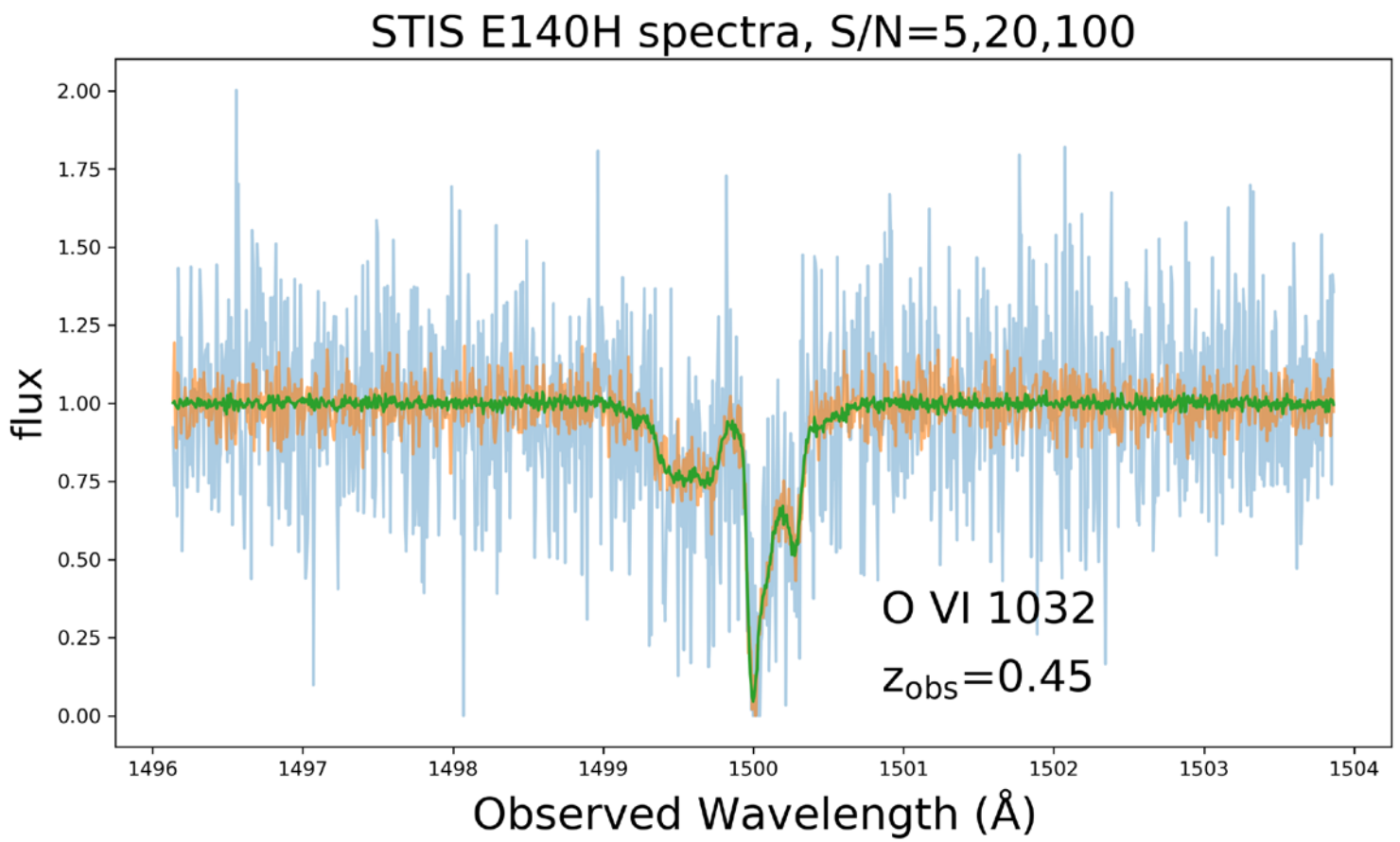
BACK TO SEARCH Science= CGM Spectra Data Type= 1D Spectra Condition= redshift 2-3 ExportTable

	Project Name	Version Name	Series Name	Redshift	M-star	Line Name	M-vir	SFR	Total Column	Impact
	foggie								0690	40.1758700
	foggie	nref11n-nre							0690	40.1758700
	foggie	nref11n-nre							3510	40.1758700
	foggie	nref11n-nre							4550	39.1911900
	foggie	nref11n-nre							2560	39.1911900
	foggie	nref11n-nre							3840	39.1911900
	foggie	nref11n-nre							5810	39.1911900
	foggie	nref11n-nre							5820	39.1911900
	foggie	nref11n-nre							0860	32.2511400
	foggie	nref11n-nre							0860	32.2511400
	foggie	nref11n-nre							0830	32.2511400
	foggie	nref11n-nre							670	43.0441440
	foggie	nref11n-nre							4790	43.0441440
	foggie	nref11n-nre							6850	43.0441440
	foggie	nref11n-nre							0830	47.2425880
	foggie	nref11n-nref10f	Tempest	2.50	1.130e+09	C IV 1548	3.770e+10	47	13.0326850	47.2425880
	foggie	nref11n-nref10f	Tempest	2.50	1.130e+09	O VI 1032	3.770e+10	47	16.5530280	47.2425880

… and select and apply instrument configuration and S/N on the fly



1 to 25 Showing 25 of 1000 results Previous 1 2 3 4 5 Next

Opportunities to Learn More About the Archived Synthetic Data Initiative

- Presentations at the STScI booth tomorrow demoing the ASDI prototype at 9:30am and 5pm
- Links to prototype version (downloadable files and data simulation via a jupyter notebook) for exploring circumgalactic absorption spectra is now live at https://archive.stsci.edu/access-mast-data/asdi; full portal coming soon
- Want to express interest, suggest different features, ask a question, or contribute synthetic data? Email archive@stsci.edu!